The Challenges of Preserving Vermont's Historic Buildings

2015 Vermont Downtown Conference

Introductions

Arnold and Scangas Architects
Laz Scangas, Principal

Bread Loaf Corporation
Paul Wyncoop, Client Service Manager

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Arnold & Scangas Architects

Arnold and Scangas is an architectural firm located in downtown St. Albans, Vermont. For the last 20 years, we have specialized in restoring historically significant buildings, especially those located in Vermont downtowns. The firm also works with local non-profits in designing affordable housing projects for the community, with many of those being in historic buildings.

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Bread Loaf Corporation

Bread Loaf Corporation is a Planning, Architecture and Construction firm, headquartered in Middlebury with a staff of 90 professionals including:

- Sustainable Designers
- LEED Accredited Professionals
- Mechanical, Electrical, Plumbing & Fire Protection Project Managers
- Architects
- Construction Managers
- Cost Estimators
- Engineers
- Historic Preservationists

Workshop Overview:

- Introduction
- Challenge #1 - Overcoming Disaster
- Challenge #2 - Meeting Preservation Standards
- Challenge #3 - Life Safety and Building Access
- Challenge #4 - Energy Efficiency
- Conclusions and Questions

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Introduction – Historical Context

- Brooks House in Brattleboro
- Town of Harford Town Offices
- UVM Alumni House in the Burlington Hill District
- Arthurs Department Store in Morrisville
- Stanislaus School in West Rutland
- Watkins Avenue School in Rutland

All Buildings are important, contributing historic structures that are in, or near established downtowns

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Brooks House completed 1871, designed by the Worcester, Mass. architectural firm of E. Boyden and Son for George Brooks to replace hotel on same site which had burned.

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Historical Context - Main Street Brattleboro and Brooks House - 1870's

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Historical Context - 1950's: Changing times and demographics, changes to building usage

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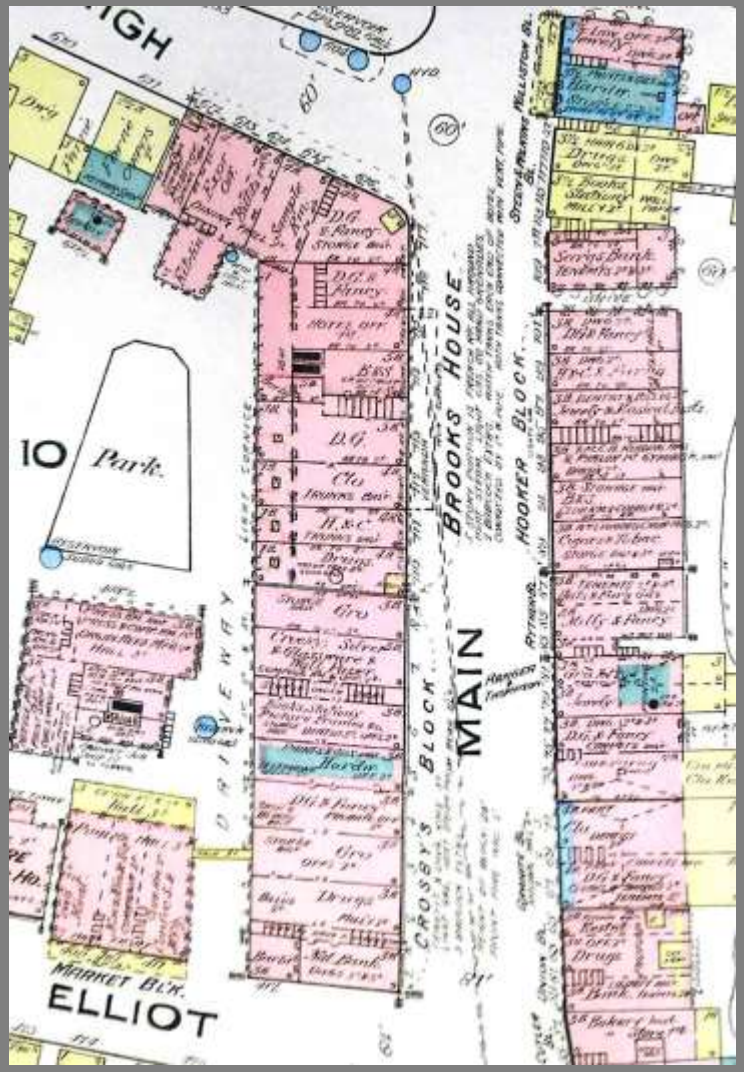
- Central location
- Many years of multiple and diverse tenants
- Often Downtown residential units
- Visual icon for downtown
- Multiple Entries and access
- Sites serve multiple functions: parking; open space; access to multiple buildings; informal meeting space
- Buildings with stories and history



Context of Brooks House in Downtown

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Historical Context – Historic View Looking East

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Historical Context - 1977: Arthur's Department Store

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Historical Context - 1978: Arthur's Department Store

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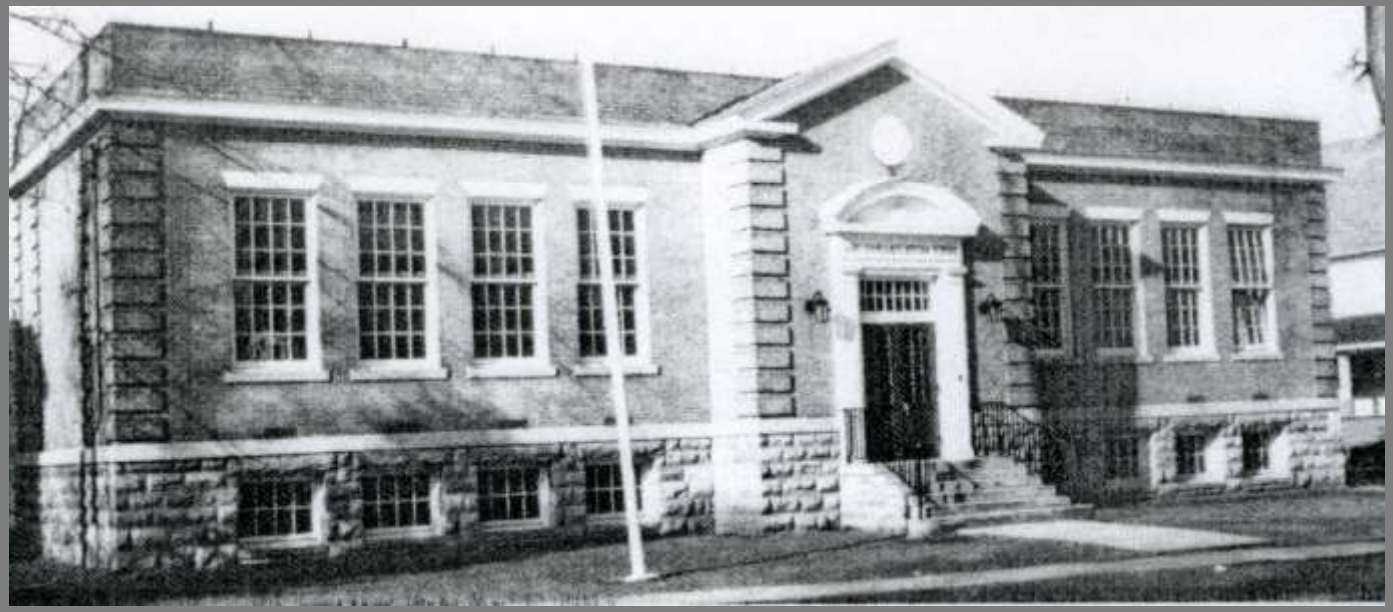

Historical Context – Stanislaus School

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Historical Context – Stanislaus Convent

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Historical context: Watkins Schools built in neighborhoods

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Historical Context – Edward Wells Residence, Burlington

Introduction – Building type/structural considerations

- Multi- story brick bearing walls with some steel and stone structure
- Wood Framed interiors
- Foundation: Stone walls with granite piers
- Some buildings with Cast Iron columns, large storefronts at first floor
- Terracotta/cast stone detailing
- Slate, metal and membrane roofing
- Mostly uninsulated
- Multiple renovations over the years

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Overview of Structure/Construction

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Overview of Structure/Construction

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Overview of Structure/Construction - Town of Hartford

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Overview of Structure/Construction - UVM Alumni House

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Overview of Structure/Construction or Lack of Construction- Arthur's Department Store

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Overview of Structure/Construction
Stanislaus School

Overview of Structure/Construction
Stanislaus Convent

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Overview of Structure/Construction
Watkins School

Challenge #1: Overcoming Disaster

- Fire and Water Damage
- Hazardous Materials
- Structural Deficiencies
- Vacancy

Challenge #1: Overcoming Disaster

- Fire and Water Damage

Brooks House Fire Damage - Confined to certain areas, water damage throughout

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Brooks House, post fire

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Brooks House - August 29, 2011

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Failure of Existing fire prevention system

- Outdated wiring and fire alarm system
- Limited fire blocking in walls
- Minimal floor to floor separation
- No sprinkler in attic areas

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Challenge #1: Overcoming Disaster

- Fire and Water Damage

Arthur's Fire Damage - Confined to certain areas

Challenge #1: Overcoming Disaster

Fire and Water Damage

Town of Hartford – November 4, 1927

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Town of Hartford Municipal Building - Basement work to allow water entry

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Town of Hartford – Installation of flood water louvers

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Town of Hartford – Flood louvers within existing fenestration pattern

Challenge #1: Overcoming Disaster

- Hazardous Materials
  - Mold
  - Lead Paint
  - Bird/Animal Waste
  - Asbestos and Other materials

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- Hazardous Materials

Mold and mold abatement

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- Hazardous Materials

Stanislaus School Mold and mold abatement

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Moisture Control

Brooks House - Moisture control at storefronts

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Moisture Control

Basement moisture mitigation

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Moisture Control

Basement moisture mitigation

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Stanislaus School Moisture Control

Basement moisture mitigation

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Stanislaus School Moisture Control

Basement moisture mitigation

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Watkins School Moisture Control

Basement moisture mitigation

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- Hazardous Abatement

Brooks House - Lead Paint

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- Hazardous Abatement

UVM Alumni House - Lead Paint

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- Hazardous Abatement

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Arthur's Hazardous Abatement

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- Hazardous Abatement

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Arthur's Hazardous Abatement

Challenge #1: Overcoming Disaster

- Structural Deficiencies

Brooks House - Structural damage/changes over time

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- Structural Deficiencies

Brooks House - Unsympathetic alterations over time/Building movement

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- Structural Deficiencies

Brooks House - Structural rework

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- Structural Upgrades

Brooks House - Steel added to upgrade structure to modern code requirements

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- Structural Upgrades

Wood reinforcing at Mansard Roof and Penthouse

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- Structural Upgrades

Steel, wood and masonry work - Brooks House

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- Structural Upgrades

Town of Hartford

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- Structural Upgrades

Town of Hartford Basement Beam Reinforcing

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- Structural Upgrades

Town of Hartford- Attic Structural Reinforcement

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Arthur's Structural Upgrades

Challenge #1: Overcoming Disaster

Structural Deficiencies

Watkins School - Structural damage over time due to roof leak

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Challenge #1: Overcoming Disaster

Vacancy

Challenge #2: Meeting Preservation Standards

- Why Preserve?
- Important Features- Exterior
- Important Features- Interior
- Challenges-
  - Brick Repair and Restoration
  - Architectural Detail in Wood
  - Windows and Storefront
  - Flashing and Roofing
  - Interior Features
  - Cast Iron

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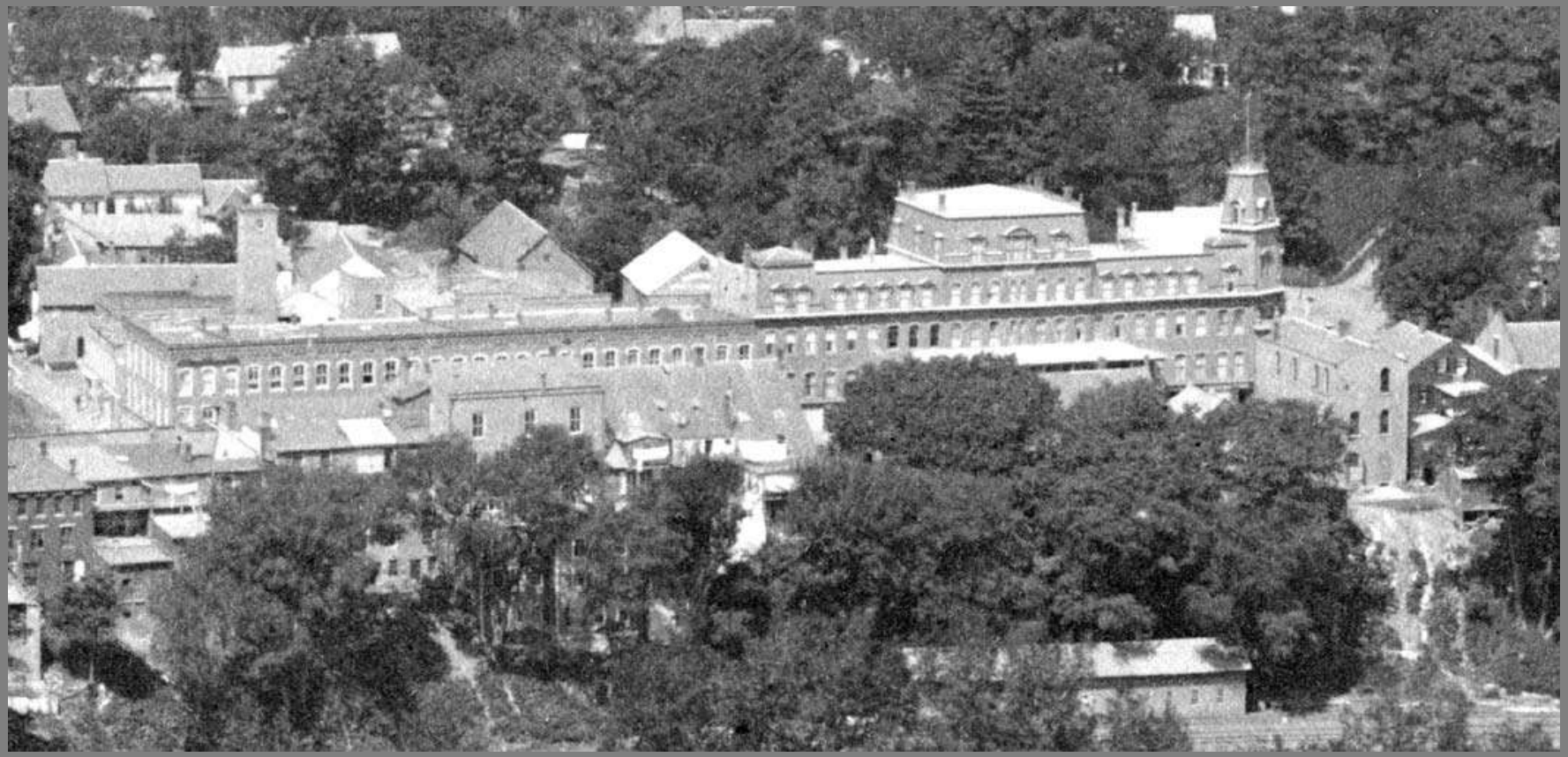

Aesthetic, Iconic, Adaptable

Within the Context of Downtowns

- Downtown Anchor - Architectural, Commercial, Historical and Cultural
- Important to local community
- Mixed Use Plan -Promotes diversity
- Often include Public Spaces
- Improve Accessibility
- Social Impacts - place-making, public space
- Financial Resiliency of fully rented building

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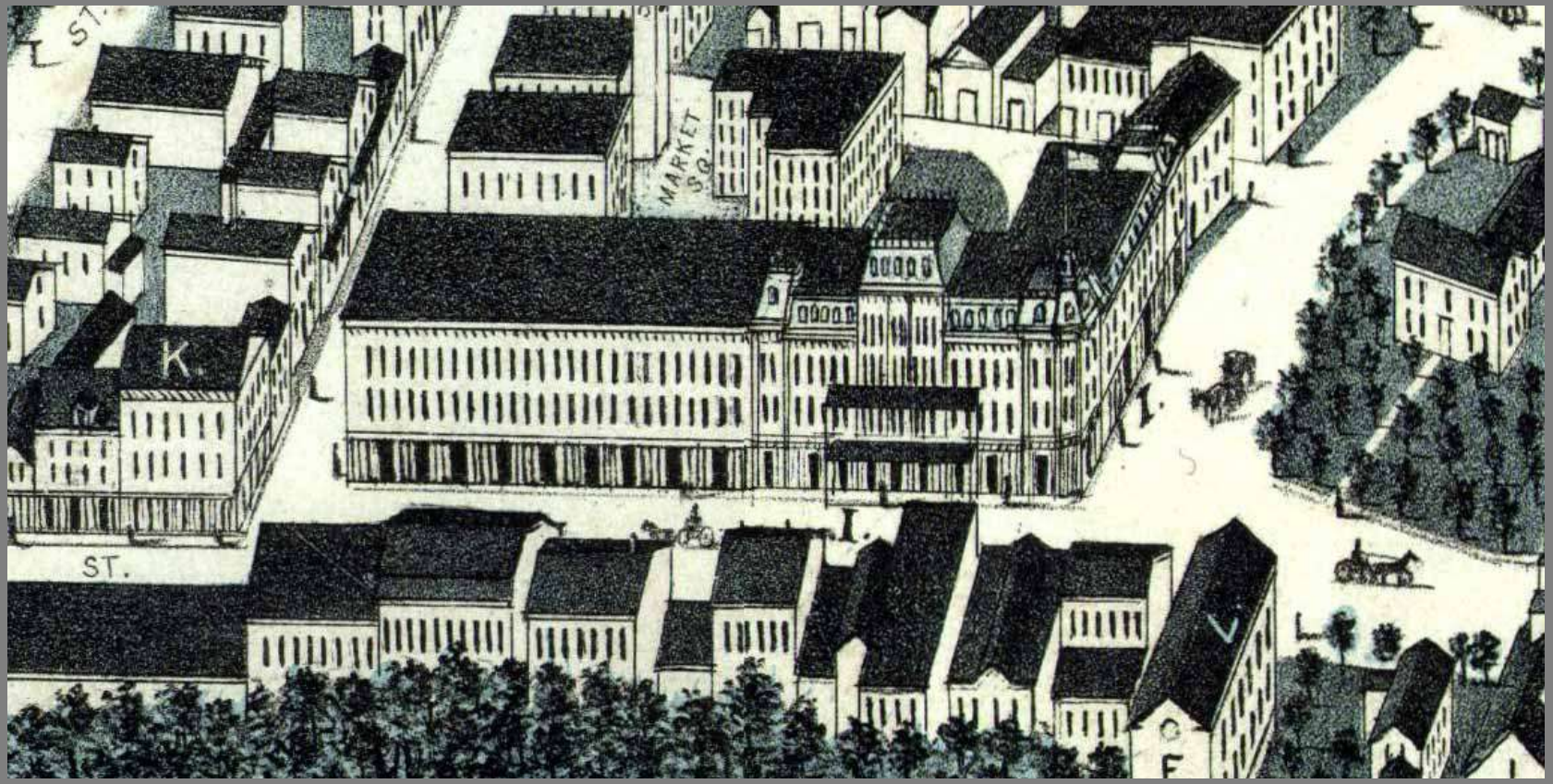
- Downtown Anchor - Architectural, Commercial, Historical and Cultural



Taking advantage of the Brooks House location in center of Brattleboro

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- Important to local community

Standing room only ribbon cutting - Local investment in many ways

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- Mixed Use Plan - diversity is resilient
- Added Public Spaces
- Improved Accessibility
- Social Impacts - place-making, public space

Commercial, educational, residential and public

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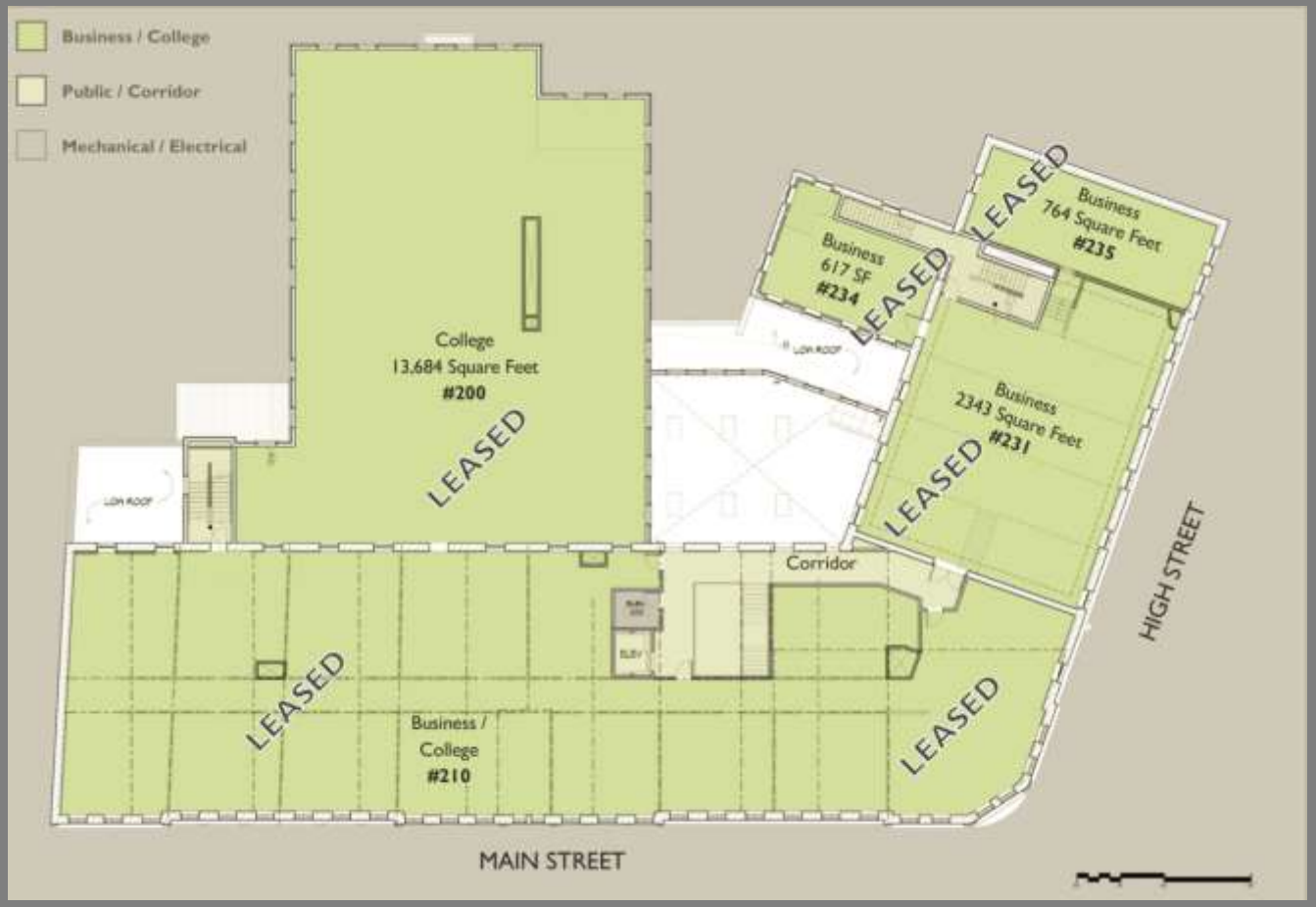
- Financial Resiliency of fully rented building



Anchor tenants with long term leases

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- Important Features- Exterior

UVM Alumni House

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- Exterior Wood Restoration

Brooks House-Replacement of elements only where necessary

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- Exterior Wood Restoration

Brooks House- Reuse of material in good condition

Spanish cedar custom trim to match existing

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- Exterior Brick Restoration

Brooks House- Terra cotta and brick rework

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- Exterior Restoration

Town of Hartford- Recreation of dormers, restoration of existing brick

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- Exterior Restoration

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- Exterior Restoration

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- Exterior Restoration

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- Interior Features

UVM Alumni House- Important original interior features throughout

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- Interior Features

Town of Hartford- Highlighting Reused material previously on exterior

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- Interior Features

Brooks House- Interior of Atrium

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- Interior Restoration

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- Interior Restoration

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- Interior Restoration

Challenge #3: Life Safety and ADA Improvements

- Requirements for Modern Code
  - Egress
  - Wall and Floor Assembly
  - Different Floor to Floor Use
  - Life Safety
  - Structural Upgrades

- Challenges-
  - Corridors, Stair, Elevator, Public Access
  - Separations and Sound Issues
  - Fire Protection During Construction
  - Upgrades to Fire Protection
  - Structural Work

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- Requirements for Modern Code
  - Egress/ADA/Elevator

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- Requirements for
- Modern Code

Egress

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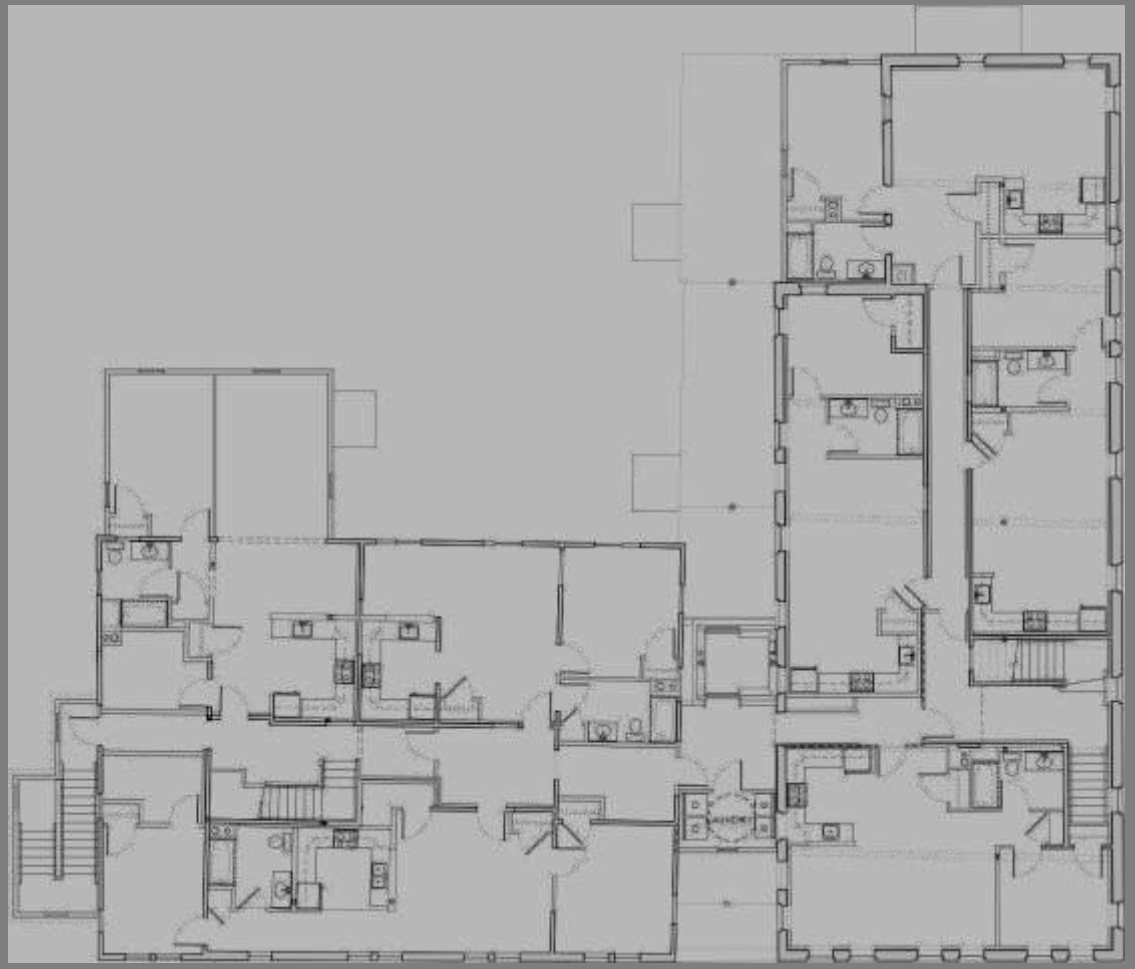
- Requirements for
- Modern Code
  - Egress



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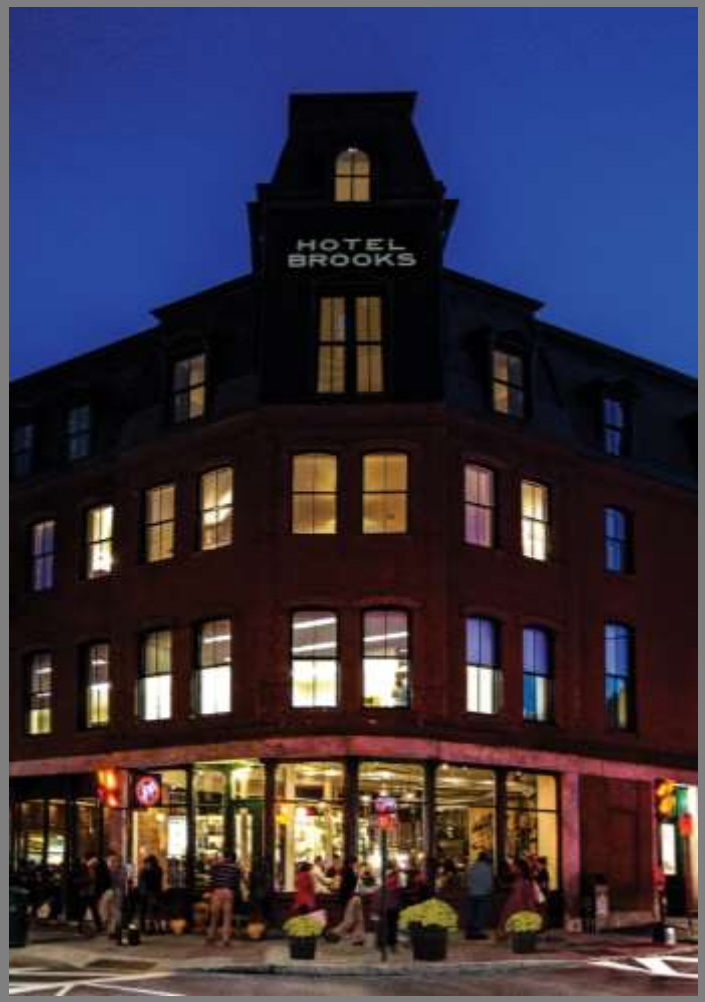
- Requirements for Modern Code
  - Life Safety



Fire Resistance in multi-level, multi-use building: Brooks House

- Fire Alarm
- Smoke and heat detection
- Wet System Sprinkler
- Floor to floor and use to use Fire separation
- Smoke evacuation system in atrium
- Fire glass and window wash in certain areas
- Magnetic hold opens for specific doors
- 2 hour rated walls for all chases through floors

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Smoke evacuation openings in atrium

Increased fire rated assemblies above ceiling between apartments

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Fire rated assembly at all structure

Window wash sprinklers at 1st floor

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Egress doors at end of atrium corridor double as smoke exhaust

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Exit doors with special operators serve as intake louvers for smoke exhaust

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New Fire alarm panels at main entry

Challenge #4: Energy Efficiency Improvements

- Requirements to meet/exceed energy code
  - Envelope Upgrades
  - New HVAC systems/ Lighting and Power
  - Windows

- Challenges-
  - Open vs. Closed Cell Insulation with existing walls
  - Added Roof Insulation
  - Heat Pumps and ERUs
  - Cooling Tower
  - Moisture control

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COLUMN BUILDING SCIENCES

Joseph W. Lstiburek

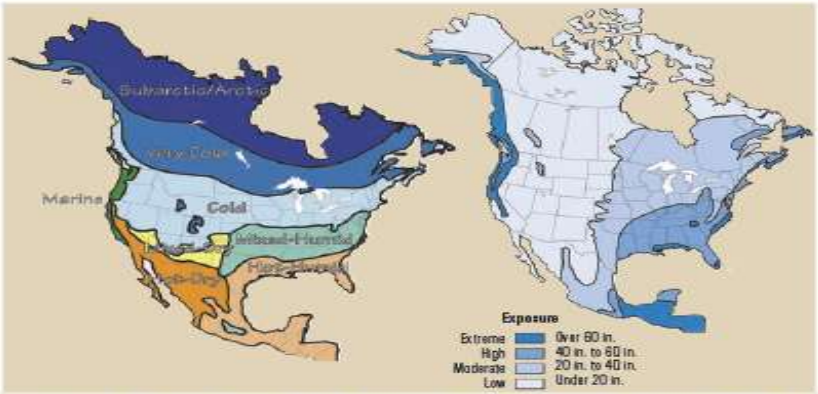

FIGURE 1 (LEFT) Hygrothermal Regions. From "Understanding Vapor Barriers" *ASHRAE Journal*, August 2004. You should worry about freeze-thaw in "Cold Climates" (or colder) that have "Moderate" (or higher) amounts of precipitation. Cold Climates are defined more precisely as IECC Climate Zone 5 or higher if you are a Yank. FIGURE 2 (RIGHT) Rainfall. From "Moisture Control for Buildings" *ASHRAE Journal*, February 2002. Where it rains more buildings get wetter. Yup. Cold and rain, double yup.

PHOTO 1 Getting It Right. Classic building at University of Toronto "Romanesque." Look at all the drip edges—at roof edges, at window openings, between floors. Notice that they are working. How can you tell? No stains. Look at this building carefully because it is an example of "what is good."

PHOTO 2 Getting It Wrong. Look at the stains. Large expanses of glass don't absorb water and water runs down them and ends up at corners that are typically "inset" with surfaces that don't slope. It gets worse, the windows themselves leak. Look at the bottom of the mullions where they meet the sill.

*"Linings Add Warmth..."**

Tailor Made

BY JOSEPH W. LSTIBUREK, PH.D., P.ENG., FELLOW ASHRAE

How do you insulate uninsulated masonry buildings on the inside? Carefully. There I go again with the obvious. It is trickier to do it on the inside. But it is often less expensive than insulating them on the outside. True, you give

Weighing building science and efficiency upgrades vs. historic preservation and architecture

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PHOTO 3 (LEFT) Getting It Wrong Continued. New building not yet screwed up but going to get there soon. We can do better than this. This is obviously a new building but the style comes directly from Frank Lloyd Wright. Frank Lloyd Wright was wrong. PHOTO 4 (RIGHT) Getting It Wrong Turning into Ugly. Efflorescence and freeze-thaw damage occurring and the cause is a combination of bad water control and bad brick. Could good brick have survived the bad water control? Maybe. But with good water control even the bad brick would have lived.

Building analysis: dewpoint and vapor migration in masonry structures

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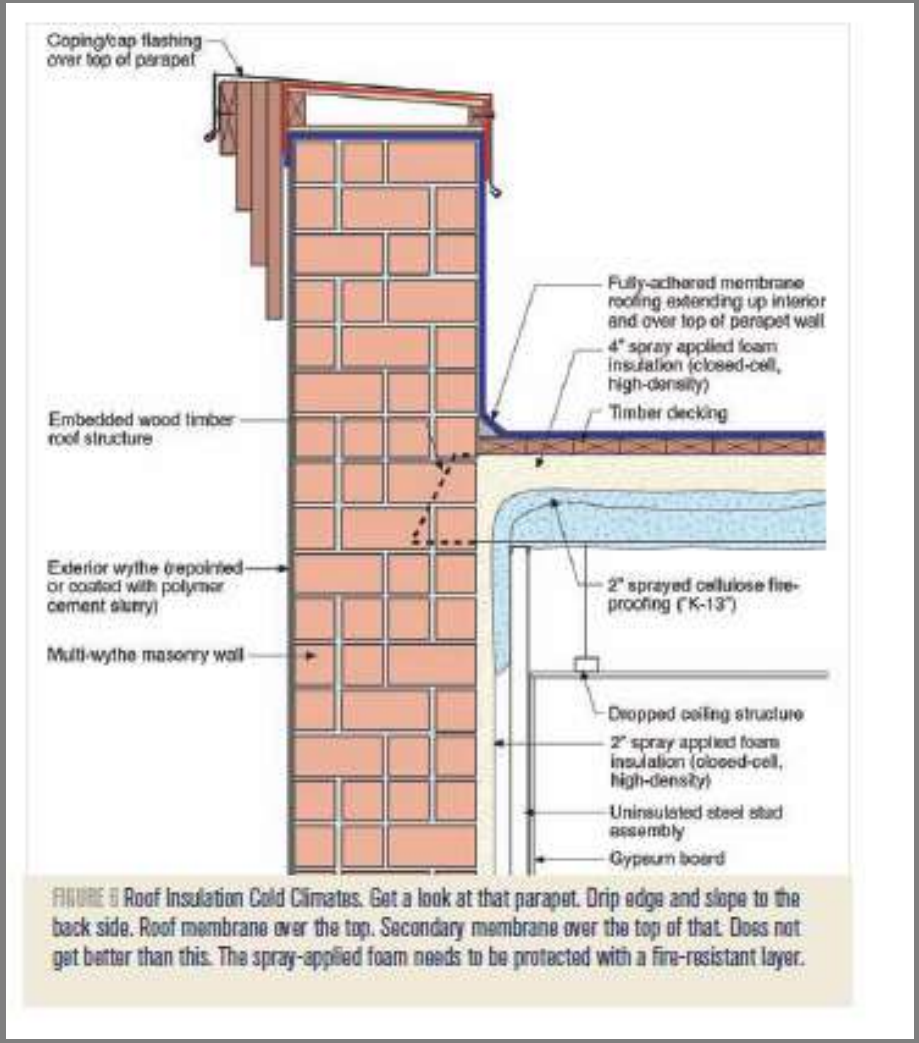

Building sections for envelope analysis

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Stanislaus Building Science

2010-05-06 West Rutland Catholic School Insulation Retrofit Durability Risk Assessment

Figure 11: Interior view of floor beam from basement

Figure 12: Moisture content measurement of beam

Figure 13: Removed foundation stone on SW side

Figure 14: End view of floor joist, showing placement

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Stanislaus Building Science Cooking in the kitchen

2010-05-06 West Rutland Catholic School Insulation Retrofit Durability Risk Assessment

Figure 23: Liquid water uptake testing

Figure 24: Drying of samples, for dry mass/density

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- Requirements to meet/exceed energy code
  - Envelope Upgrades

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- Thermal Envelope Improvements

Open cell and Closed cell spray foam at Brooks House

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- Thermal Envelope Improvements

Brooks House: Closed cell at ceilings and wood framed walls. Roof also included continuous rigid insulation

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- Thermal Envelope Improvements

Brooks House: Sound insulation floor to floor

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- Thermal Envelope Improvements

UVM Alumni House-

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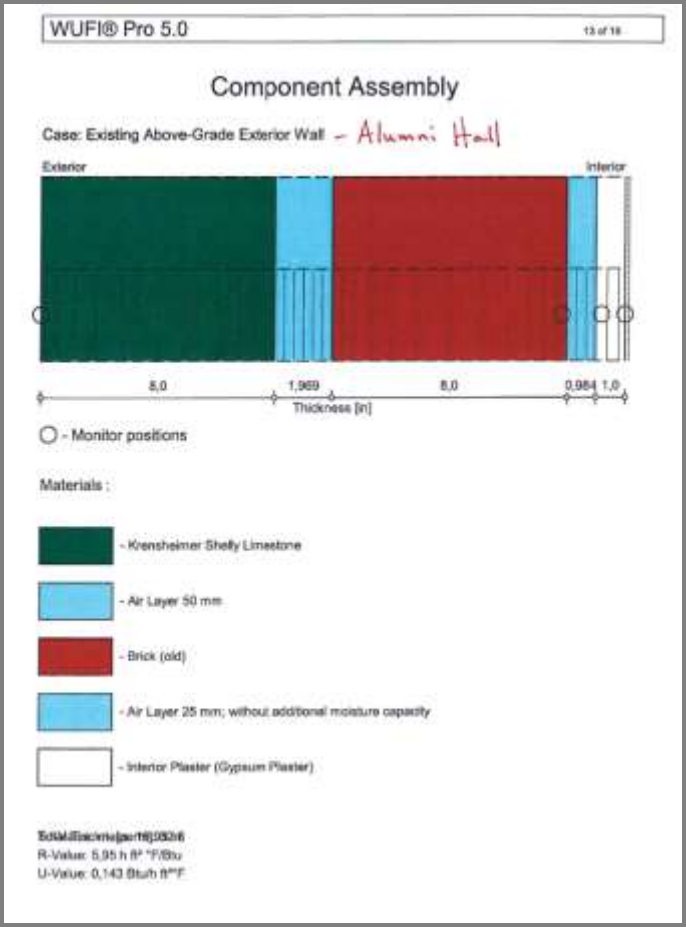
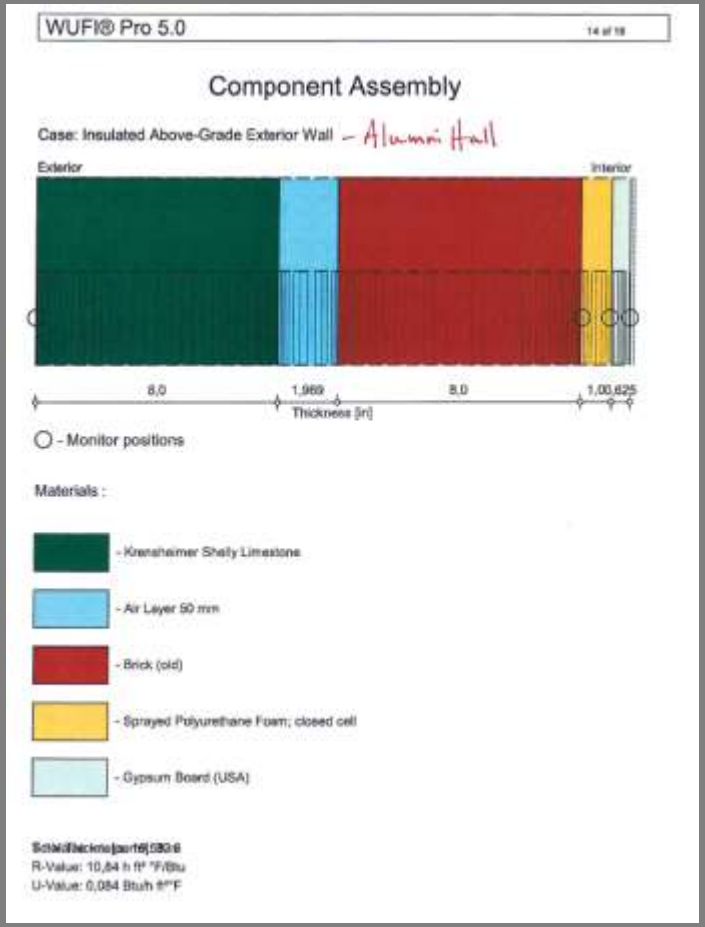
- Thermal Envelope Improvements





UVM Alumni house- envelope analysis

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- Thermal Envelope Improvements

UVM Alumni house

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- Thermal Envelope Improvements

Town of Hartford: Quest for net-zero. Building analysis revealed masonry cavity in walls

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- Thermal Envelope Improvements

		Windows					Curtain Wall			Insulation		
Item	**Base Exisitng Building**	**Run # 1 New Base**	**Run # 2**	**Run # 3**	**Run # 4**	**Run # 5**	**Run # 6**	**Run # 7**	**Run # 8**	**Run # 9**	**Run # 10**	**Run # 11**
Basement Walls	Masonary, No insualtion R-2	4" Foam, top 4' R-22	4" Foam, top 4' R-22	4" Foam, top 4' R-22	4" Foam, top 4' R-22	4" Foam, top 4' R-22	4" Foam, top 4' R 22	4" Foam, top 4' R-22	4" Foam, top 4' R-22	4" Foam, top 4' R-22	4" Foam, top 4' R-22	4" Foam, top 4' R 22
Basement Slab	Concrete, No insualtion R-1	Concrete no inusation R-1	Concrete no inusation R-1	Concrete no inusation R-1	Concrete no inusation R-1	Concrete no inusation R-1	Concrete no inusation R-1	Concrete no inusation R-1	Concrete no inusation R-1	Concrete no inusation R-1	Concrete no inusation R-1	Concrete no inusation R-1
First Floor	No Insulation	8" mineral fiber R-30	8" mineral fiber R-30	8" mineral fiber R-30	8" mineral fiber R-30	Concrete no inusation R-1	Concrete no inusation R-1	Concrete no inusation R-1	Concrete no inusation R-1	Concrete no inusation R-1	Concrete no inusation R-1	Concrete no inusation R-1
Walls	Brick, No insuation R-4	5"water blown spray foam R-30	5"water blown spray foam R-30	5"water blown spray foam R-30	5"water blown spray foam R-30	5"water blown spray foam R-30	6"water blown spray foam R-30	6"water blown spray foam R-30	6"water blown spray foam R-30	6"water blown spray foam R-30	5"water blown spray foam R-30	6"water blown spray foam R-30
Roof / Attic	Batts + misc. R-10 to R-30 on attic floor	8" spray foam in rafters R-40	8" spray foam in rafters R-40	8" spray foam in rafters R-40	8" spray foam in rafters R-40	8" spray foam in rafters R-40	8" spray foam in rafters R-40	8" spray foam in rafters R-40	8" spray foam in rafters R-40	8" spray foam in rafters R-40	10" spray foam in rafters R-40	10" spray foam in rafters R-40
Air Leakage	High	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Entry Curtain Wall	N/A	xxx	xxx	xxx	xxx	xxxx	Kwaneer TriFab VG451T 2"x4.5" w/ I" insulated glass	Kwaneer TriFab VG451T 2"x4.5" w/Alpin 925 insulated glass	Andy please put in the best performing curtian wall description for this run	Kwaneer TriFab VG451T 2"x4.5" w/ I" insulated glass	Kwaneer TriFab VG451T 2"x4.5" w/ I" insulated glass	Kwaneer TriFab VG451T 2"x4.5" w/ I" insulated glass
Windows	Double Hung w/ storm R-1.7	Fixed over Awning Listed R-9.1/R-6.7 Alpin 925	Double Hung Listed R-5 Alpin 725	Marvin Integrity Double Hung Listed R-3.33	Marvin Ultimate / Magnum Fixed over Awning Listed R-3.57???	Marvin Ultimate / Magnum Double Hung triple glaszed krypton argon Listed R-4.34???	Fixed over Awning Listed R-9.1/R-6.7 Alpin 925	Fixed over Awning Listed R-9.1/R-6.7 Alpin 925	Fixed over Awning Listed R-9.1/R-6.7 Alpin 925	Fixed over Awning Listed R-9.1/R-6.7 Alpin 925	Fixed over Awning Listed R-9.1/R-6.7 Alpin 925	Fixed over Awning Listed R-9.1/R-6.7 Alpin 925

Town of Hartford- energy analysis

The Challenges of Preserving Vermont's Historic Buildings

- Thermal Envelope Improvements

Town of Hartford

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Town of Hartford

The Challenges of Preserving Vermont's Historic Buildings

- Thermal Envelope Improvements

Arthur's

The Challenges of Preserving Vermont's Historic Buildings

- Thermal Envelope Improvements

Stanislaus

The Challenges of Preserving Vermont's Historic Buildings

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The Challenges of Preserving Vermont's Historic Buildings

- Thermal Envelope Improvements

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The Challenges of Preserving Vermont's Historic Buildings

BreadLoaf
Architects
Planners
Builders

- Requirements to meet/exceed energy code
  - Windows

Brooks House- Windows

The Challenges of Preserving Vermont's Historic Buildings

- Requirements to meet/exceed energy code
  - Windows

UVM Alumni House- windows

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- Requirements to meet/exceed energy code
  - Windows

Town of Hartford- Windows

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- Arthur's Requirements to meet/exceed energy code
  - Windows

Watkins School - Windows

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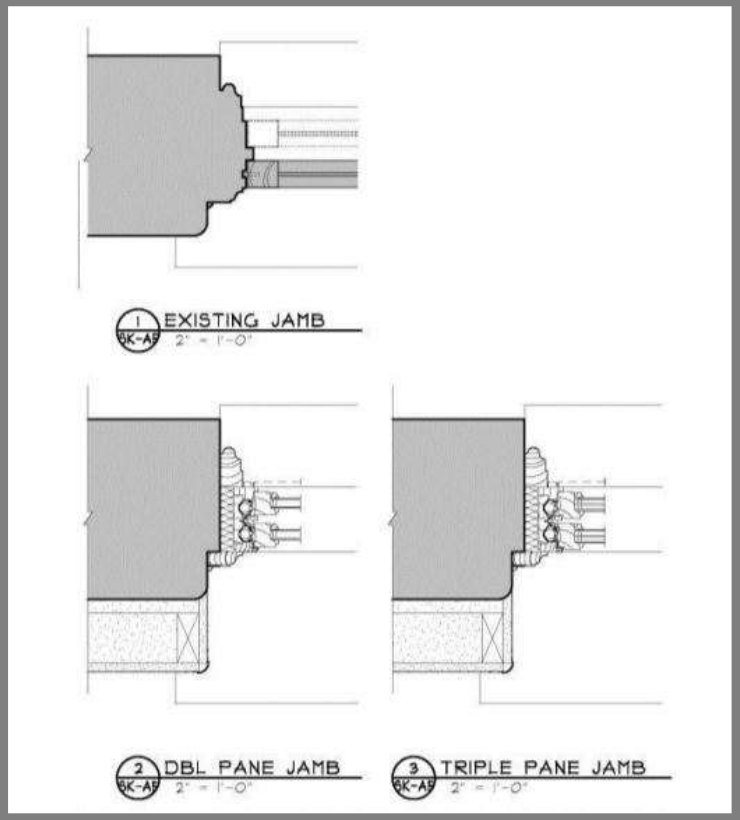
- Stanislaus Requirements to meet/exceed energy code
  - Windows



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- Requirements to meet/exceed energy code
- Windows

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- Mechanical, Electrical, Plumbing and Fire Protection Upgrades

Brooks House- High efficiency boilers

- High efficiency boilers
- Heat pump system utilizes excess heat and cooling
- Energy Recovery Units
- Digital Control System
- High Efficiency Lighting
- Sprinkler, Fire Alarm, Smoke exhaust system
- New wireless, cable, phone and data infrastructure

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- Mechanical, Electrical, Plumbing and Fire Protection Upgrades

Infrastructure improvements

The Challenges of Preserving Vermont's Historic Buildings

- Requirements to meet/exceed energy code
  - New HVAC systems

Town of Hartford- Air to Air Heat Pump System

The Challenges of Preserving Vermont's Historic Buildings

- Mechanical, Electrical, Plumbing and Fire Protection Upgrades

Town of Hartford- Air to Air Heat Pump System

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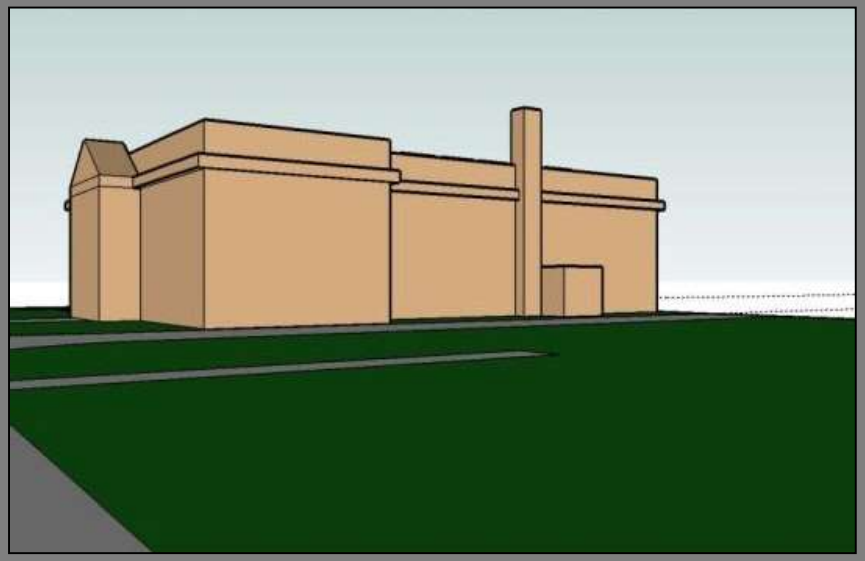
- Requirements to meet/exceed energy code
  - New domestic solar hot water



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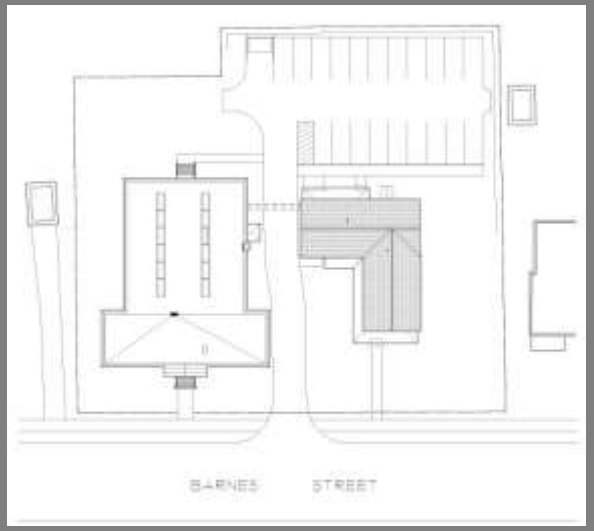
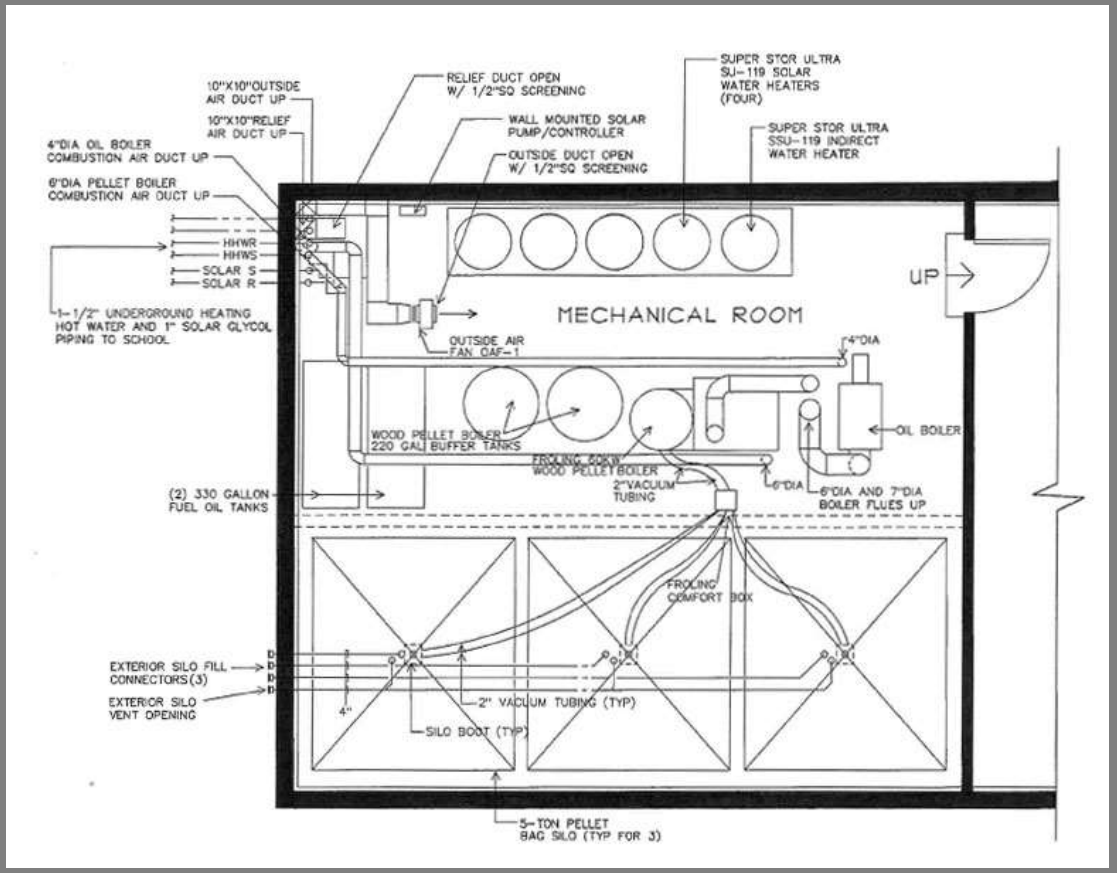
- Stanislaus Requirements to meet/exceed energy code
  - New HVAC systems





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- Stanislaus Requirements to meet/exceed
- energy code
  - New HVAC systems

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Workshop Recap:

- Introduction
- Challenge #1- Overcoming Disaster
- Challenge #2- Meeting Preservation Standards
- Challenge #3- Life Safety and Building Access
- Challenge #4- Energy Efficiency
- Conclusions and Questions

THANK YOU!

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Brooks House Atrium after completion

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Brooks House- Duo Restaurant

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Brooks House- Apartment

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Brooks House- Storefront on Main Street

The Challenges of Preserving Vermont's Historic Buildings

Arthur's

The Challenges of Preserving Vermont's Historic Buildings

Stanislaus

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